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Ephemeris for Physical Observations

Greenwich Noon		Angle of Position of ♃'s Axis. P	L−O.	Latitude of Earth above ♃'s Equator. B	Latitude of Sun above ♃'s Equator. R	Annual Parallax. A−L.	Longitude of ♃'s Central Meridian. (877°·90) I.	Longitude of ♃'s Central Meridian. (870°·27) II.	Corr. for Phase.
1890		°	°	°	°	°	°	°	°
Mar.	23	343·946	170·226	−0·780	−1·006	− 9·410	229·38	130·72	+0·39
	28	343·646	171·081	·739	0·985	9·839	298·37	161·56	·42
Apr.	2	343·366	171·890	·699	·963	10·221	7·42	192·46	·45
	7	343·106	172·650	·660	·941	10·554	76·53	223·42	·48
	12	342·867	173·358	·622	·919	10·835	145·71	254·44	·51
	17	342·649	174·010	·585	·898	11·060	214·95	285·53	·53
	22	342·453	174·602	·549	·876	11·225	284·26	316·68	·55
	27	342·280	175·131	·515	·854	11·326	353·63	347·90	·56
May	2	342·129	175·595	−0·483	−0·832	−11·361	63·07	19·19	+0·56
	7	342·001	175·990	·453	·810	11·327	132·57	50·54	·56
	12	341·897	176·313	·424	·787	11·221	202·15	81·96	·55
	17	341·817	176·561	·397	·765	11·040	271·80	113·45	·53
	22	341·762	176·733	·373	·743	10·782	341·51	145·02	·51
	27	341·731	176·826	·352	·720	10·445	51·29	176·65	·48
June	1	341·724	176·840	−0·333	−0·698	−10·029	121·14	208·34	+0·44
	6	341·743	176·774	·316	·675	9·534	191·05	240·09	·40
	11	341·786	176·630	·302	·653	8·959	261·02	271·91	·35
	16	341·854	176·408	·291	·630	8·305	331·05	303·79	·30
	21	341·946	176·111	·283	·608	7·577	41·12	335·71	·25
	26	342·061	175·743	·277	·585	6·778	111·24	7·68	·20
July	1	342·198	175·310	−0·274	−0·562	− 5·914	181·40	39·69	+0·15
	6	342·355	174·818	·274	·559	4·990	251·59	71·72	·11
	11	342·531	174·275	·277	·517	4·014	321·80	103·78	·07
	16	342·723	173·689	·281	·494	2·996	32·01	135·84	·04
	21	342·927	173·071	·288	·471	1·945	102·22	167·90	+0·02
	26	343·142	172·432	·297	·448	− 0·873	172·41	199·94	·00
	31	343·362	171·784	·307	·425	+ 0·210	242·58	231·95	·00
Aug.	5	343·584	171·137	−0·318	−0·402	+ 1·291	312·71	263·93	−0·01
	10	343·804	170·504	·331	·379	2·357	22·78	295·86	·02
	15	344·018	169·896	·344	·356	3·399	92·79	327·72	·05
	20	344·221	169·324	·357	·332	4·406	162·73	359·51	·08
	25	344·409	168·798	·370	·309	5·366	232·59	31·22	·13
	30	344·579	168·328	·382	·286	6·272	302·37	62·85	·17
Sept.	4	344·727	167·920	−0·394	−0·263	+ 7·116	12·05	94·38	−0·22

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of Jupiter, 1890. By A. Marth.

Greenwich Noon.	Apparent Diam. Equat.	Apparent Diam. Polar.	Difference of limbs in A.R.	Difference of limbs in Decl.	Defect of illumination. Equat.	Defect of illumination. in A.R.	Defect of illumination. in Decl.	*d*	*w*
1890.	"	"	s	"	"	s	"	°	°
Mar. 23	34·92	32·70	2·454	32·87	0·23	0·016	0·02	9·41	271·55
28	35·35	33·11	2·481	33·29	·26	·017	·02	9·84	·60
Apr. 2	35·82	33·54	2·510	33·73	·28	·019	·02	10·22	·65
7	36·31	34·00	2·541	34·20	·31	·020	·02	10·56	·70
12	36·82	34·48	2·575	34·69	·33	·022	·02	10·84	·74
17	37·37	34·99	2·610	35·21	·35	·023	·03	11·06	·79
22	37·94	35·52	2·647	35·75	·36	·024	·03	11·23	·85
27	38·53	36·07	2·686	36·31	·37	·024	·03	11·33	·90
May 2	39·14	36·65	2·727	36·89	0·38	0·025	0·03	11·37	·94
7	39·77	37·24	2·769	37·49	·39	·025	·03	11·33	271·99
12	40·42	37·84	2·813	38·10	·39	·025	·03	11·23	272·04
17	41·08	38·46	2·858	38·72	·38	·025	·03	11·05	·09
22	41·74	39·08	2·903	39·35	·37	·024	·03	10·79	·14
27	42·41	39·71	2·949	39·98	·36	·023	·03	10·45	·20
June 1	43·08	40·33	2·996	40·61	0·33	0·021	0·03	10·04	·27
6	43·73	40·94	3·042	41·23	·30	·020	·02	9·55	·34
11	44·37	41·54	3·088	41·83	·27	·018	·02	8·97	·43
16	44·98	42·12	3·132	41·91	·24	·015	·02	8·31	·55
21	45·56	42·66	3·174	42·95	·20	·013	·02	7·58	·70
26	46·10	43·16	3·214	43·45	·16	·011	·01	6·79	272·85
July 1	46·59	43·62	3·251	43·91	0·12	0·008	0·01	5·92	273·00
6	47·02	44·02	3·284	44·31	·09	·006	·01	4·99	273·3
11	47·38	44·36	3·313	44·65	·06	·004	·00	4·02	273·7
16	47·67	44·63	3·337	44·91	·03	·002	...	3·00	274·4
21	47·88	44·83	3·356	45·10	·01	·000	...	1·95	275·7
26	48·00	44·95	3·369	45·21	...	...	...	0·89	280·5
31	48·05	44·99	3·375	45·24	...	...	...	0·24	59·0
Aug. 5	48·00	44·94	3·376	45·19	0·01	0·000	...	1·29	86·1
10	47·86	44·81	3·371	45·06	·02	·001	...	2·36	88·8
15	47·65	44·61	3·359	44·85	·04	·003	·00	3·40	89·7
20	47·35	44·33	3·341	44·56	·07	·005	·01	4·41	90·3
25	46·98	43·99	3·318	44·21	·10	·007	·01	5·37	90·7
30	46·54	43·58	3·290	43·80	·14	·009	·01	6·27	90·9
Sept. 4	46·05	43·12	3·258	43·33	0·18	0·012	0·01	7·12	91·1

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Greenwich Noon.	Angle of Position of ♃'s Axis. P	L–O.	Latitude of Earth above ♃'s Equator. B	Latitude of Sun above ♃'s Equator. R	Annual Parallax. Λ–L.	Longitude of ♃'s Central Meridian. (877°·90) I.	Longitude of ♃'s Central Meridian. (870°·27) II.	Corr. for Phase.
1890. Sept. 9	344°·851	167°·581	–0°·404	–0°·240	+7°·891	81°·63	125°·82	–0°·27
14	344·949	167·316	·413	·216	8·592	151·11	157·16	·32
19	345·018	167·129	·421	·193	9·215	220·49	188·39	·37
24	345·057	167·023	·426	·170	9·757	289·77	219·52	·41
29	345·066	166·999	·430	·146	10·218	358·95	250·55	·45
Oct. 4	345·045	167·057	–0·432	–0·123	+10·597	68·04	281·49	–0·49
9	344·994	167·196	·431	·099	10·895	137·03	312·33	·52
14	344·913	167·416	·428	·076	11·112	205·93	343·08	·54
19	344·803	167·715	·423	·052	11·251	274·74	13·75	·55
24	344·666	168·091	·415	·029	11·314	343·47	44·34	·56
29	344·504	168·540	·405	–0·005	11·303	52·13	74·85	·56
Nov. 3	344·317	169·059	–0·392	+0·018	+11·223	120·72	105·30	–0·55
8	344·108	169·644	·377	·042	11·077	189·25	135·68	·53
13	343·879	170·293	·359	·065	10·867	257·72	166·00	·51
18	343·631	171·003	·339	·089	10·597	326·14	196·27	·49
23	343·367	171·769	·317	·112	10·271	34·51	226·49	·46
28	343·088	172·586	·292	·136	9·893	102·84	256·67	·43
Dec. 3	342·797	173·452	–0·265	+0·159	+9·467	171·13	286·82	–0·39
8	342·496	174·364	·236	·183	8·996	239·40	316·94	·35
13	342·186	175·318	·205	·207	8·483	307·64	317·04	·31
18	341·870	176·309	–0·171	+0·230	+7·933	15·86	17·11	–0·27

The angle L–O+180° is the Jovicentric longitude of the Earth, reckoned in the plane of *Jupiter's* equator from O, the point of the vernal equinox of *Jupiter's* northern hemisphere or the point of the ascending node of the planet's orbit on its equator. The angle Λ–O+180° is the corresponding longitude of the Sun, or Λ–L the difference between the two longitudes. The two values of the "longitude of ♃'s central meridian," given for each date, depend on the elements adopted in the ephemeris for 1889. As observations of the white spots in the neighbourhood of the planet's equator, which may have been made during the last opposition, have not yet reached me, I do not know how far the adopted daily rate 877°·90 of system I. represents their present motion, and must content myself with referring to the comparison of preceding observations given on p. 94 of vol. xlix. Some observations of the remnant of the great reddish spot, kindly communicated by Mr. Denning, show that the spot preceded last year the adopted zero-meridian of system II. about six or seven minutes, so that in case the indicated acceleration of its motion has meanwhile been main-

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Greenwich Noon.	Apparent Diam.		Difference of limbs		Defect of illumination.			*d*	*w*
	Equat.	Polar.	in A.R.	in Decl.	Equat.	in A.R.	in Decl.		
1890.	"	"	s	"	"	s	"	°	°
Sept. 9	45·51	42·61	3·222	42·82	0·22	0·014	0·01	7·89	91·25
14	44·93	42·06	3·182	42·27	·25	·017	·02	8·59	91·37
19	44·32	41·49	3·139	41·69	·29	·019	·02	9·22	91·48
24	43·68	40·90	3·095	41·09	·32	·021	·02	9·76	91·58
29	43·03	40·29	3·049	40·48	·34	·023	·02	10·22	91·67
Oct. 4	42·37	39·67	3·002	39·86	0·36	0·024	0·02	10·60	91·78
9	41·71	39·05	2·954	39·24	·38	·025	·02	10·90	91·86
14	41·06	38·44	2·906	38·63	·38	·026	·02	11·12	91·93
19	40·41	37·83	2·859	38·02	·39	·026	·02	11·26	91·99
24	39·78	37·24	2·813	37·43	·39	·026	·02	11·32	92·06
29	39·16	36·66	2·767	36·85	·38	·026	·02	11·31	92·13
Nov. 3	38·56	36·10	2·722	36·29	0·37	0·025	0·02	11·23	92·20
8	37·99	35·57	2·679	35·76	·35	·024	·02	11·09	92·28
13	37·44	35·06	2·637	35·25	·34	·023	·02	10·88	92·36
18	36·92	34·57	2·597	34·76	·32	·021	·02	10·61	92·45
23	36·43	34·11	2·559	34·30	·29	·020	·02	10·28	92·54
28	35·96	33·67	2·523	33·87	·27	·018	·02	9·90	92·63
Dec. 3	35·53	33·26	2·489	33·47	0·24	0·016	0·02	9·48	92·73
8	35·12	32·88	2·456	33·09	·22	·014	·01	9·01	92·84
13	34·74	32·53	2·425	32·74	·19	·013	·01	8·49	92·96
18	34·39	32·20	2·397	32·42	·16	·011	·01	7·94	93·09

tained or increased, the difference may now be considerably greater.—The differences of successive values of the longitudes of ♃'s central meridian amount, for the intervals of five days, to twelve rotations in addition to the differences directly deduced, so that, for instance, the differences of the first two values are 4388°·99 and 4350°·84. The addition of the "correction for phase" to the longitudes of the central meridian gives the longitudes of the meridian which bisects the illuminated disc.

The values of the apparent diameters of the disc, &c., depend on the same data as in the ephemerides for preceding years. The formulæ employed may be found in vol. xlv. p. 508. The defects of illumination are before opposition on the preceding side and south, and after opposition on the following side and north.

The following is a list of Greenwich mean times, when the zero meridian in the assumed two systems of longitudes will pass the middle of the illuminated disc. The times of intermediate passages must be found by interpolation, the intervals

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between successive passages being $9^{h}\ 50^{m}\cdot40$ to $50^{m}\cdot67$ in the first system, and $9^{h}\ 55^{m}\cdot58$ to $55^{m}\cdot85$ in the second.

	I. (877°·90)	II. (870°·27)		I. (877°·90)	II. (870°·27)
	h m	h m		h m	h m
Mar. 24	18 56·9	22 1·8	April 30	16 44·1	17 40·3
25	14 37·0	17 53·2	May 1	12 25·1	13 31·6
26	20 8·7	23 40·5	2	17 56·6	19 18·7
27	15 49·8	19 31·9	3	13 37·6	15 10·0
28	21 31·5	15 23·4	4	19 9·1	20 57·1
29	17 2·6	21 10·6	5	14 50·1	16 48·4
30	22 34·3	17 2·1	6	20 21·6	12 39·8
31	18 15·4	22 49·3	7	16 2·6	18 26·8
Apr. 1	13 56·5	18 40·8	8	21 34·1	14 18·1
2	19 28·2	14 32·2	9	17 5·1	20 5·1
3	15 9·3	20 19·4	10	12 56·1	15 56·5
4	20 40·9	16 10·9	11	18 27·5	21 43·5
5	16 22·0	21 58·0	12	14 8·5	17 34·8
6	21 53·7	17 49·5	13	19 40·0	13 26·1
7	17 34·8	13 40·9	14	15 20·9	19 13·1
8	23 6·4	19 28·1	15	20 52·4	15 4·4
9	18 47·5	15 19·5	16	16 33·3	20 51·4
10	14 28·5	21 6·7	17	12 14·3	16 42·7
11	20 0·1	16 58·1	18	17 45·7	12 34·0
12	15 40·2	12 49·5	19	13 26·6	18 21·0
13	21 12·8	18 36·7	20	18 58·1	14 12·3
14	16 53·9	14 28·1	21	14 39·0	19 59·2
15	22 25·5	20 15·2	22	2 41 Shadow of *Sat. IV.* crosses central meridian.	
16	18 6·5	16 6·6			
17	13 47·6	21 53·8	22	20 10·4	15 50·5
18	19 19·2	17 45·2	23	15 51·4	11 41·8
19	15 0·2	13 36·6	24	11 32·3	17 28·7
20	20 31·8	19 23·7	25	17 3·7	13 20·0
21	16 12·8	15 15·1	26	12 44·6	19 6·9
22	21 44·4	21 2·2	27	18 16·0	14 58·2
23	17 25·4	16 53·6	28	13 56·9	20 45·1
24	13 6·4	12 44·9	29	19 28·3	16 36·4
25	18 38·0	18 32·0	30	15 9·2	12 27·7
26	14 19·0	14 23·4	31	20 40·6	18 14·6
27	19 50·5	20 10·5	June 1	16 21·5	14 5·8
28	15 31·6	16 1·8	2	12 2·4	19 52·7
29	21 3·1	21 48·9	3	17 33·8	15 44·0

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		I. (877°·90)		II. (870°·27)	
		h	m	h	m
June	4	13	14·7	11	35·2
	5	18	46·0	17	22·2
	6	14	26·9	13	13·4
	7	19	58·2	19	0·2
		20	48	Shadow of *S. IV.*	
	8	15	39·1	14	51·5
	9	11	20·0	20	38·3
	10	16	51·3	16	29·6
	11	12	32·2	12	20·8
	12	18	3·5	18	7·6
	13	13	44·4	13	58·8
	14	19	15·7	19	45·7
	15	14	56·6	15	36·9
	16	10	37·4	11	28·1
	17	16	8·7	17	14·9
	18	11	49·6	13	6·1
	19	17	20·9	18	53·0
	20	13	1·7	14	44·2
	21	18	33·0	10	35·4
	22	14	13·9	16	22·2
	23	9	54·7	12	13·4
	24	14	57	Shadow of *S. IV.*	
		15	26·0	18	0·2
	25	11	6·8	13	51·4
	26	16	38·1	9	42·6
	27	12	18·9	15	29·3
	28	17	50·2	11	20·5
	29	13	31·0	17	7·3
	30	9	11·8	12	58·5
July	1	14	43·1	8	49·7
	2	10	23·9	14	36·4
	3	15	55·1	10	27·6
	4	11	36·0	16	14·4
	5	17	7·2	12	5·6
	6	12	48·0	17	52·3
	7	8	28·8	13	43·5
	8	14	0·1	9	34·7
	9	9	40·9	15	21·4

		I. (877°·90)		II. (870°·27)	
		h	m	h	m
July	10	15	12·1	11	12·6
	11	9	6	Shadow of *S. IV.*	
		10	52·9	16	59·4
	12	16	24·2	12	50·5
	13	12	5·0	8	41·7
	14	17	36·2	14	28·4
	15	13	17·0	10	19·6
	16	8	57·8	16	6·4
	17	14	29·1	11	57·5
	18	10	9·9	17	44·3
	19	15	41·1	13	35·4
	20	11	21·9	9	26·6
	21	16	53·1	15	13·4
	22	12	34·0	11	4·5
	23	8	14·8	16	51·3
	24	13	46·0	12	42·4
	25	9	26·8	8	33·6
	26	14	58·0	14	20·4
	27	10	38·9	10	11·6
	28	3	16	Shadow of *S. IV.*	
		16	10·1	15	58·3
	29	11	50·9	11	49·5
	30	7	31·7	7	40·7
		17	22·1	17	36·3
	31	13	4·0	13	27·4
Aug.	1	8	43·8	9	18·6
	2	14	15·1	15	5·4
	3	9	55·9	10	56·6
	4	15	27·1	16	43·4
	5	11	9·0	12	34·5
	6	16	39·2	8	25·7
	7	12	20·1	14	12·5
	8	8	0·9	10	3·7
	9	13	32·2	15	50·6
	10	9	13·1	11	41·8
	11	14	44·4	17	28·6
	12	10	25·3	13	19·8
	13	15	56·6	9	11·0

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		I.		II.	
		(877°·90)		(870°·27)	
		h	m	h	m
Aug.	13	21	27	Shadow of *S. IV*.	
	14	11	37·4	14	57·9
	15	17	8 8	10	49·1
	16	12	49·6	16	36·0
	17	8	30·5	12	27·2
	18	14	1·9	8	18·4
	19	9	42 8	14	5·3
	20	15	14·1	9	56·6
	21	10	55·0	15	43·5
	22	16	26·4	11	34·7
	23	12	7·3	7	26·0
	24	7	48·3	13	12·9
	25	13	19·6	9	4·2
	26	9	0·6	14	51·1
	27	14	32·0	10	42·4
	28	10	12·9	16	29·3
	29	15	44·3	12	20·6
	30	11	25·3	8	11·9
		15	38	Shadow of *S. IV*.	
	31	7	6·2	13	58·9
Sept.	1	12	37·7	9	50·2
	2	8	18·6	15	37·2
	3	13	50·1	11	28·5
	4	9	31·1	7	19·9
	5	15	2 6	13	6·9
	6	10	43·5	8	58·2
	7	6	24·5	14	45·2
	8	11	56·0	10	36·6
	9	7	37·1	6	27·9
	10	13	8·6	12	15·0
	11	8	49·6	8	6·3
	12	14	21·1	13	53·4
	13	10	2·1	9	44 8
	14	15	33·7	15	31·9
	15	11	14·7	11	23·3
	16	6	55·8	7	14·7
		9	50	Shadow of *S. IV*.	
	17	12	27·3	13	1·8

		I.		II.	
		(877°·90)		(870° 27)	
		h	m	h	m
Sept.	18	8	8·4	8	53·2
	19	13	40·0	14	40·3
	20	9	21·0	10	31·7
	21	14	52·6	6	23·1
	22	10	33·7	12	10·3
	23	6	14·8	8	1·7
	24	11	46·4	13	48·9
	25	7	27·5	9	40·3
	26	12	59·1	15	27 5
	27	8	40·2	11	18·9
	28	14	11·9	7	10·4
	29	9	53·0	12	57·6
	30	15	24·7	8	49·1
Oct.	1	11	5·8	14	36·3
	2	6	46·9	10	27·8
	3	4	4	Shadow of *S. IV*.	
		12	18·6	6	19·2
	4	7	59·7	12	6·5
	5	13	31·5	7	58·0
	6	9	12·6	13	45·2
	7	14	44·3	9	36·7
	8	10	25·5	5	28·2
	9	6	6·6	11	15·5
	10	11	38·4	7	7·0
	11	7	19·5	12	54·3
	12	12	51·3	8	45·8
	13	8	32·5	14	33·1
	14	14	4·2	10	24·7
	15	9	45·4	6	16·2
	16	5	26·6	12	3·5
	17	10	58·4	7	55·0
	18	6	39·6	13	42·4
	19	12	11·4	9	33·9
		22	17	Shadow of *S. IV*.	
	20	7	52·6	5	25·5
	21	13	24·4	11	12·8
	22	9	5·6	7	4·4
	23	4	46·8	12	51·7

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	I. (877°·90)	II. (870°·27)
	h m	h m
Oct. 24	10 18·6	8 43·3
25	5 59·9	4 34·9
26	11 31·7	10 22·3
27	7 12·9	6 13·9
28	12 44·8	12 1·2
29	8 26·0	7 52·8
30	13 57·9	13 40·2
31	9 39·1	9 31·8
Nov. 1	5 20·3	5 23·4
2	10 52·2	11 10·8
3	6 33·5	7 2·4
4	12 5·3	12 49·8
5	7 46·6	8 41·5
	16 30	Shadow of *S. IV*
6	13 18·5	4 33·1
7	8 59·7	10 20·5
8	4 41·0	6 12·1
9	10 12·9	11 59·6
10	5 54·2	7 51·2
11	11 26·1	13 38·6
12	7 7·4	9 30·3
13	12 39·3	5 21·9
14	8 20·6	11 9·4
15	13 52·5	7 1·0
16	9 33·8	12 48·5
17	5 15·1	8 40·1
18	10 47·0	4 31·8
19	6 28·3	10 19·3
20	12 0·2	6 10·9
Nov. 21	7 41·5	11 58·4
22	3 22·8	7 50·1
	10 44	Shadow of *S. IV.*
23	8 54·8	3 41·7
24	4 36·1	9 29·2
25	10 8·0	5 20·9
26	5 49·3	11 8·4
27	11 21·3	7 0·1
28	7 2·6	12 47·6
29	12 34·6	8 39·2
30	8 15·9	4 30·9
Dec. 1	3 57·2	10 18·4
2	9 29·2	6 10·1
3	5 10·5	11 57·6
4	10 42·5	7 49·3
5	6 23·8	3 41·0
6	11 55·8	9 28·5
7	7 37·1	5 20·2
8	3 18·4	11 7·7
9	4 58	Shadow of *S. IV.*
	8 50·4	6 59·4
10	4 31·8	12 46·9
11	10 3·7	8 38·6
12	5 45·1	4 30·3
13	11 17·1	10 17·8
14	6 58·4	6 9·5
15	12 30·4	11 57·0
16	8 11·7	7 48·7

The reason why in the list the times are added, when the shadow of *Satellite IV.* crosses the central meridian is: to remind observers of the favourable opportunities, which they may have during the latter part of the present apparition, of contributing by proper measurements of the coordinates of the shadow (and also of the satellite before and after its transits and occultations) to the proper determination of several elements of the orbit, as I have explained in a note published in vol. xliv., p. 241, on the last occasion, when such measurements would have been of special value.

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Erratum in NAUTICAL ALMANAC *for* 1890, *p.* 454.

July 11. Transit of shadow of *Jupiter's* fourth Satellite.

	h	m		h	m
For	5	46	and	10	26
Read	6	46	and	11	26